

## Mantle Changes in the Pearl Oyster *Pinctada maxima* Induced by the Pea Crab *Pinnotheres villosulus*

BY

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(1 Plate)

CHENG (1967) REVIEWED the numerous studies of the general biology and relationships of pinnotherid crabs associated with bivalve molluscs. Damage to or erosion of the bivalve's gills has been observed repeatedly and PEARCE (1966) revealed that "... constant irritation by the crab dactyls caused a blister or cyst-like formation ..." on the mantle of *Modiolus modiolus* (Linnaeus, 1758), a condition McDERMOTT (1962) had reported for *Anomia simplex* Orbigny, 1845, infested by *Pinnotheres*, and STAUBER (1945) for a few specimens of *Ostrea* (= *Crassostrea*) *virginica* Gmelin, 1791 infested by *P. ostreum* (Say, 1817).

These observations apparently have not been extended by microscopical studies. Current interest in invertebrate pathology and in the etiology of invertebrate tumors (PAULEY, 1969) prompted an investigation of the histology of mantle swelling induced by pinnotherid crabs. Adult *Pinnotheres villosulus* Guerin, 1830, induce pronounced mantle swelling in the pearl oyster *Pinctada maxima* (Jameson, 1901) and provided material for the present study.

### METHODS AND MATERIALS

General observations and notes on the incidence of pea crabs and induced mantle thickenings were made in conjunction with other studies on 126 *Pinctada maxima* collected in the Torres Straits, North Queensland, between December 1969 and November 1970. Further material for histological work was collected in 1971.

Most histological specimens were fixed at the collection site while some in 1971 were airfreighted to Townsville and maintained in the sea there until fixation. Excised

thickened pallial mantle from 15 pearl oysters was fixed in Davidson's fluid (SHAW & BATTLE, 1957) or formol calcium (PEARSE, 1960). Fixed tissues were routinely dehydrated, Paraplast embedded, sectioned at 6-8  $\mu$ m and stained using (1) Ehrlich's haematoxylin and eosin; (2) the connective tissue techniques of Masson's trichrome for collagen and muscle, Gomori's aldehyde fuchsin for elastin, Gordon and Sweet's method for reticulin (DRURY & WALLINGTON, 1967) and Mallory's PTAH method for muscle (LUNA, 1960); (3) the mucosubstance techniques, PAS and alcian blue/chlorotone fast red (PEARSE, 1960).

A previous study of mantle histology (DIX, in press) furnished normal material for comparison.

### RESULTS

**General Observations:** In each parasitised pearl oyster a pinnotherid crab was always found clinging firmly to one mantle lobe and facing inwards in the anterior part of the mantle cavity near the foot, gills and palps of the bivalve (Figure 1). No more than one crab was found in a pearl oyster and most of the crabs were female. Associated with the crab was a conspicuous firm lump of thickened mantle; this was up to 1 cm thick and was always found on the mantle ventral to the crab. The lump was slightly concave to partially accommodate the crab and the mantle immediately beneath the crab was wrinkled rather than the normal smooth (Figure 2). Gill or palp erosion was not evident in any of the pearl oysters with crabs.

Pea crabs with associated mantle lumps were common in the pearl oysters as 67½% of the 126 bivalves examined had one pinnotherid or mantle lump or both. Mantle lumps without were found in 7.1%, indicating that the association may not be permanent. However, crabs without associated mantle lumps were never observed although presumably this must occur early in the association; it is noted that no juvenile pearl oysters were examined.

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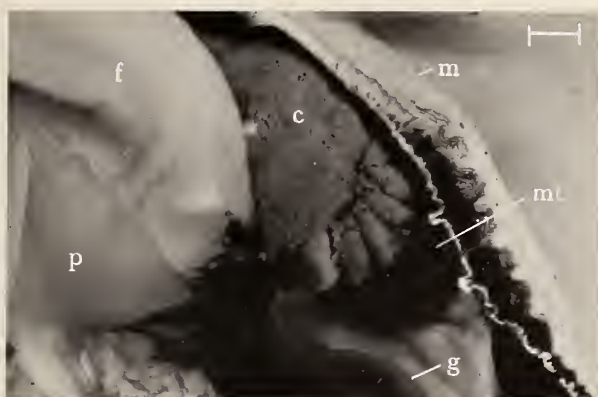


Figure 1

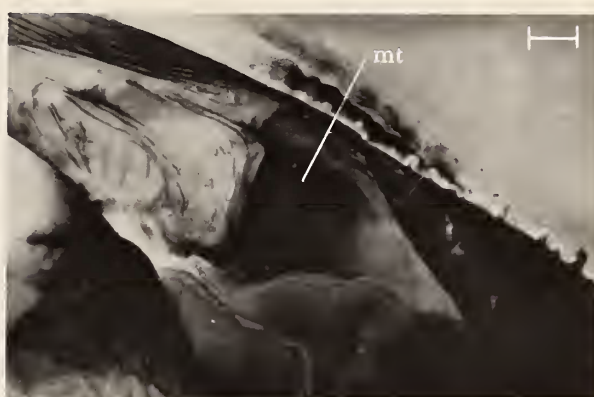


Figure 2



Figure 3

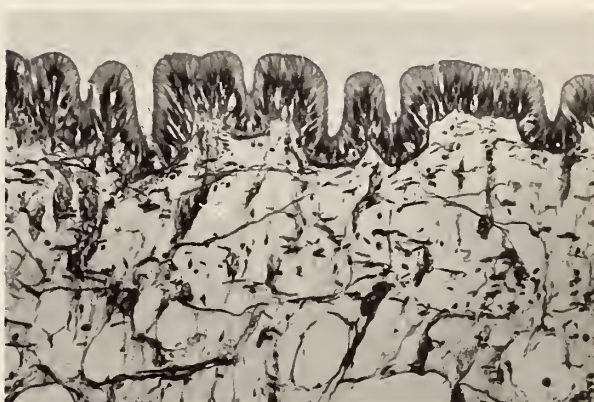


Figure 4

Figure 1: *Pinnotheres villosulus* in the mantle cavity of *Pinctada maxima*. The crab (c) was always found in this region, near the foot (f), palps (p), and gills (g). The pronounced lump (mt) is evident adjacent to the crab. Note the absence of gill erosion and the normal marginal mantle (m). Scale line=0.5 cm

Figure 2: Mantle with crab removed showing thickening (mt) and the wrinkled mantle where the crab was situated. Scale line=1.0 cm

Figure 3: Stroma of the mantle thickening showing numerous irregularly arranged muscle fibers (mf) in a collagenous matrix (co) next to a muscle band (mb). Masson's trichrome;  $\times 200$

Figure 4: Inner pallial mantle epithelium from beneath a pinnotherid crab. Note the tall columns of epithelial cells and numerous subepithelial secretory cells (ss). Haematoxylin and eosin;  $\times 280$